1.1 INTRODUCTION

The story of salmon in Puget Sound is one told in rivers, streams, and the marine waters of Puget Sound. That story of migration, spawning, growth, abundance, and decline is a common one, experienced by all of the watersheds in the Puget Sound region, including the Green/Duwamish and Central Puget Sound Watershed (Figure 1-1).

But the future of this story is in jeopardy. Will people a century hence view the salmon as a living icon of their watersheds? Or will it be a historical symbol of a bygone era that can only be viewed in the wild by traveling to Canada or Alaska? Will future stories acknowledge the wisdom and effort of our generation, which saw problems and boldly solved them? Or will our descendents shake their heads at our lack of understanding and commitment that left them an impoverished watershed that functioned poorly for both people and fish?

No less important is the fact that the present decline in watershed health that harms salmon also jeopardizes other goods and services that the watershed provides its many human residents at low or no cost: clean, abundant water, locally-grown foods, forest products, flood protection, recreational opportunities, and great natural beauty. Will we take action to conserve a resource that benefits us daily in many ways?

We who share this watershed have an opportunity to shape the answers to these questions as we decide whether and how to implement the recommendations of this Salmon Habitat Plan.

After 120 years of intense development, the strains on fish and the ecosystem of the Green/Duwamish and Central Puget Sound Watershed began to be apparent to many. We ask much from our watershed. The ecosystem goods and services it provides include water for drinking and industrial purposes, food, forest products, waste assimilation, numerous recreational opportunities, and floodwater retention. For many years, it provided a wealth of salmon, too. As more of these goods and services have been demanded than can be sustainably renewed, watershed health has suffered. In response to these stresses and changes in national, state, and local priorities over the last three decades, we have begun to take better care of the watershed and its ecosystem.

Green/Duwamish and Central Puget Sound Watershed (WRIA 9) at a Glance

Human population:
630,329 (2004 est.)

Chinook salmon population:
2,450 to 11,500 adults per year
(highly variable)

Appraised land value:
$27.6 billion

Improvements value:
$43.9 billion

Square miles:
664 total (575 land area)

River miles (mainstem):
93

Puget Sound shoreline miles:
90

Value of ecological goods and services per year (waste assimilation, recreation, flood reduction, etc.):
$1.7 billion to $6.3 billion per year
(depending on assumptions)

People and fish are never far apart in the watershed, as shown here in Auburn at river mile 30 on the Green River. July 2004 photo.

Stewardship of the watershed is evolving. For over a century following European settlement, the watershed was a bank from which resources could be drawn seemingly endlessly. The Green/Duwamish and Central Puget Sound Watershed offered a bounty of drinking water, fish, forest products, farm products, and minerals. Later, it became a center for commerce and industry in Western Washington and the watershed became a sink into which wastes could be poured with apparently few consequences. In the 1960s, environmental protection efforts began to address some of the consequences of these patterns of use. Initial efforts focused on specific, obvious problems such as point source water pollution from factories. Recent recognition of the ecological importance of the entire watershed has resulted in a broader appreciation of the environmental health and ecological integrity of the watershed. Beginning in the 1980s, people in the watershed began to seek to reduce ongoing sources of harm, protect remaining healthy habitats, and restore degraded areas. During the 1990s, a wide variety of private and public land owners and managers committed to being better stewards of the farm, forest lands, parks, and natural areas that make up much of the watershed. Improvements in growth management and stormwater practices helped reduce the impacts of the rapid population growth and development in the last decade of the 20th century.

The federal government listing of Chinook salmon and bull trout as "threatened" under the Endangered Species Act (ESA) accelerated the change in perspective and a greater motivation for action. The Green/Duwamish summer/fall Chinook and Newaukum Creek summer/fall stocks are included in the Puget Sound Evolutionarily Significant Unit (ESU) for Chinook. This ESU was listed as "threatened" under the ESA in 1999.

In response to these federal listings, the WRIA 9 (Water Resource Inventory Area) Forum of Local Governments helped fund the creation of this Salmon Habitat Plan ("Plan") to guide protection and restoration of Chinook salmon and bull trout in the Green/Duwamish and Central Puget Sound Watershed. The Forum includes all the local governments –15 cities and King County – in the watershed. The City of Tacoma also is a partner because of the importance of the Green River for its municipal water supply.

This Habitat Plan recommends actions that should be taken over the next 10 years to protect and restore salmon habitat, using an ecosystem approach, in the Green/Duwamish and Central Puget Sound Watershed. These efforts will complement habitat improvements in other parts of Puget Sound and changes to hatchery and harvest practices and thereby contribute to the recovery of Puget Sound Chinook salmon and bull trout.

Even within the watershed, this Salmon Habitat Plan is a piece of a larger picture. Many individuals, non-profit groups, businesses, and governments have worked hard to protect and improve ecosystem health and salmon habitat for years. Some have made long-term commitments that will contribute greatly to watershed salmon recovery.

This Plan recommends a comprehensive approach to protect and restore salmon habitat in the Green/Duwamish and Central Puget Sound Watershed. It provides a strategy to accelerate salmon habitat recovery locally and recommends specific and achievable projects, programs, and policies that can be implemented within the first 10 years following plan adoption. The Plan relies on an ecosystem approach

FIGURE1-1: Green/Duwamish and Central Puget Sound Watershed

with a focus on the needs of Chinook salmon. Many if not most of its recommendations also will benefit bull trout (also listed as "threatened) and other non-listed species such as coho salmon and steelhead trout.

Watershed ecosystem health and salmon recovery is a long-term task that will take decades and may last as long as a century. While this Plan focuses on actions in the next 10 years, it provides tools that can be used in the future to develop and evaluate actions. Its adaptive management program, moreover, will provide valuable information to further refine and target additional actions. This Plan has a practical, 10-year focus for most actions complemented by a long-term vision and enduring tools for further work. These actions and vision, as well as other interesting facts about the watershed, are depicted in the WRIA 9 poster, "Making our Watershed Fit for a King."

Although the recommendations of this Habitat Plan are based on the best collective judgment of its many authors, new information in the future should be used to refine and modify these recommendations. To be most effective, this Plan should be considered a "living document." What this means is that when someone picks up a copy in 2015, they'll find dog-eared pages, implementation notes jotted alongside project descriptions, inserted summaries of new scientific information, new project ideas on post-its, project construction and ribbon-cutting photos inserted between pages, references to monitoring reports for completed projects, and, assuredly, a dust-free cover.

The Plan before you is the product of ever-greater voluntary cooperation in assessing, planning for, and acting to meet salmon habitat needs across the watershed. Local governments, federal and state agencies, business and environmental interests, private property owners, volunteers, and interested citizens have demonstrated enormous dedication and public spiritedness. They are essential participants in this long, increasingly fruitful endeavor. Good stewardship of the watershed and its salmon populations in the years ahead will surely rely on continued cooperation and shared responsibility.

1.2 WHY DO WE NEED A WATERSHED SALMON HABITAT PLAN?

Native-origin Chinook salmon in the Green/Duwamish and Central Puget Sound Watershed could become extinct within our lifetimes.

In response to this possibility, the National Marine Fisheries Service (now known as NOAA Fisheries) listed Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) as a threatened species under the ESA in March 1999. The U.S. Fish and Wildlife Service listed bull trout (*Salvelinus confluentus*) as a threatened species in November 1999.

Approximately 106 wild salmon stocks in the Pacific Northwest are now extinct, 214 are at high or moderate risk of extinction, and others being reviewed for listing under the Endangered Species Act.

The causes of decline attributable to human activities include:

- Hydropower operations;
- Fishing (harvest);
- Poor hatchery practices; and
- Degradation of habitat through land use and water-use practices.

The Green River is the primary source of drinking water for the City of Tacoma and many of its suburbs. Water is diverted at the Tacoma Headworks at river mile 61. July 2004 photo.

In addition, climatic and ocean changes are responsible for natural variability that provides a background of change. Predation of salmon by mammals, birds, and other fish during different life history stages also has an impact on salmon populations.

Although the relative impact of these factors varies among watersheds, habitat loss and degradation are considered contributing factors in the decline of most salmonid[1] populations (Spence et al.1996).

Although many people are working today to help salmon in our watershed, more work is needed to arrest the decline of these fish and restore the health of the ecosystem that sustains them. This Habitat Plan builds on existing work and takes advantage of the latest scientific understanding to chart a course for habitat improvements over the next 10 years and provides tools and information for the years beyond.

The watershed Habitat Plan relies on local knowledge and dedication to identify and solve problems in our watershed. It is part of the commitment across Puget Sound to develop a bottom-up recovery plan that will meet the requirements of the Endangered Species Act while being informed by the knowledge and values of our communities. This Puget Sound-wide plan — the Shared Strategy— will be the venue for integrating habitat solutions for this watershed with other habitat efforts and efforts to address hatchery, harvest, and hydropower impacts.

There is another compelling reason for marshalling the resources and energy to implement this Habitat Plan: the health of the watershed. The Green/Duwamish and Central Puget Sound Watershed sustains a human population of 630,000 people with goods and services worth billions of dollars.

Just a few of these include:

- Domestic water supply;
- Produce and other farm products;
- Forest products;
- Mitigation of floods and droughts;
- Detoxification and decomposition of wastes;
- Recreational opportunities; and
- Aesthetic beauty.

Healthy watersheds provide many of these services for free and in perpetuity and others at low cost. As our watershed is degraded, we lose these services or have to pay more to create substitutes (e.g., stormwater systems to manage runoff exacerbated by large amounts of pavement). Investments in ecosystem health to benefit salmon and bull trout also will yield benefits for people. Alternatively, failure to act to protect and restore the watershed – which may cause the loss of wild Chinook salmon— will cost us in other ways as well.

1.3 WHAT DO SALMON NEED?

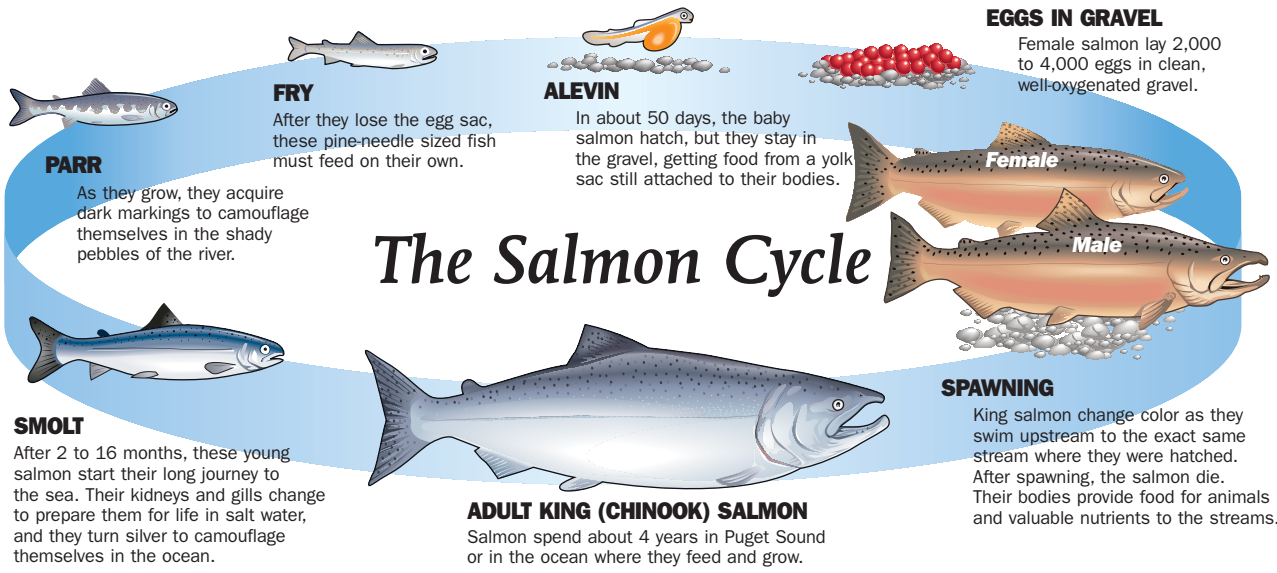
The needs of salmon are few and straightforward. They need:

- Cool, unpolluted water;
- Spawning gravels that are not scoured out by high flows or covered up with deposits of fine sediment;
- Accessible freshwater habitats– side channels, off-channel marshes and sloughs, and shallow water areas — that provide food, shelter from predators, and refuge from high stream flows;
- Nearshore marine habitats that provide food, shelter, and migration corridors to and from the Pacific Ocean; and
- An opportunity to return to their natal streams at the time they are ready to spawn.

Long-term salmon recovery depends on:

- Protecting existing high quality habitat;
- Protecting and improving water quality and ensuring adequate streamflows;
- Restoring rivers, streams, estuaries, and nearshore habitats that have been degraded, guided by an understanding of population needs, current habitat conditions, and the salmon-producing capacity of streams, rivers, and the marine nearshore;
- Maximizing access to suitable habitats in the watershed;
- Reforming hatcheries so their management supports viable salmonid populations; and
- Managing harvest to ensure adequate escapement of wild-spawning fish.

1. Salmonids include salmon, trout, and chars (including bull trout) from the Family Salmonidae.



1.4 WHAT IS OUR GOAL AND WHERE ARE WE NOW?

The following long-term (50- to 100-year) population targets for summer/fall Chinook salmon in WRIA 9 are:

- 17,000 spawning adults annually (lower limit);
- 27,000 spawning adults (midpoint and adopted target); and
- 37,000 spawning adults (upper limit).

Refinement of these targets is expected to occur as additional analyses are completed. These targets have been accepted by the Puget Sound Technical Recovery Team (TRT) and by the Washington State Department of Fish and Wildlife (see January 25, 2005 letter in Appendix A).

Portions of the Middle Green River, shown here at river mile 39, provide good spawning and rearing habitat.

For context, the current target number for spawning adult summer/fall Chinook for the Green/Duwamish River watershed is approximately 9,300 Chinook. Of this number, 5,800 fish are targeted to spawn in the river ("escapement"), and 3,500 adult fall Chinook are intended for broodstock. Broodstock are artificially spawned at the Soos Creek Salmon Hatchery.

The number of returning fall Chinook to the Green River varies tremendously year to year. From 1989 to 2001, total returning fall Chinook naturally spawning in the river ranged from 2,450 to 11,500. Summer/fall Chinook returning to the hatchery have exceeded 9,000 adults every year since 1995, except for 2000, when approximately 6,000 returned.

In addition to the numerical target focused on abundance, the recommendations of the Habitat Plan are intended to improve the three other viable salmonid population parameters by:

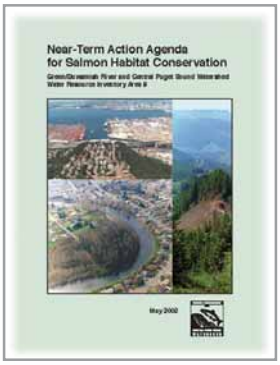
- Increasing productivity (growth rate) of the population;
- Improving diversity in terms of genetic makeup and behavioral traits; and
- Improving the spatial structure of the population to better distribute fish to take advantage of good habitat and to lower risk from catastrophic events.

1.5 WHAT HISTORY DOES THE PLAN BUILD ON?

This Habitat Plan is the result of a five-year planning effort supported by the WRIA 9 Steering Committee and Forum. The Steering Committee is a cooperative effort with members representing the variety of perspectives found in the basin, including government, business, recreation, agriculture, the environment, and others. The Forum is the WRIA decision-making body composed of the 16 local governments in the WRIA 9 watershed plus Tacoma Public Utilities.

Although the Habitat Plan is focused on future steps, it is important to acknowledge the dedication and successes to date in this watershed.

Despite being intensively developed, this watershed still retains a natural ecosystem worth saving and improving. It also is reaping the fruits of the millions of dollars and thousands of hours devoted to salmon habitat and ecosystem health in recent years. These commitments range from local grants from the local King Conservation District to over $7.3 million in federal and state funds from the Salmon Recovery Funding Board. A partnership between the U.S. Army Corps of Engineers, Indian tribes, and local governments has begun to implement a suite of projects in the Green/Duwamish Watershed portion of WRIA 9. An extensive array of farm management practices and other land use policies, regulations, and programs that are implemented by all local governments also improve conditions for fish while preserving sustainable agriculture and urban and rural residential areas. For example, the development rights for over 13,000 acres (county-wide) have been acquired through the Farmland Preservation Program and are therefore protected from development. Improved stormwater management by cities large and small is contributing to reduced impacts on streams from development.



Much of the work done to improve the watershed ecosystem is listed in the 2002 WRIA 9 Near-Term Action Agenda and two subsequent annual progress reports.

Hundreds of acres of high-quality habitat have been preserved through public purchase and innovative incentive programs. Growth management has focused development in the existing urban areas, helping to keep rural areas rural for the benefit of rural residents and fish. Meanwhile, countless private landowners quietly go to the expense and effort of managing their land to preserve its habitat value. Finally, thousands of volunteers have donated their labor to plant native trees and shrubs and control invasive weeds.

Chapter 2, Introduction, provides a brief description of these and other efforts. A more complete summary is in the 2002 Near-Term Action Agenda (along with two annual follow-up progress reports), which was developed as an interim predecessor to this Habitat Plan.

The many accomplishments to date are a foundation for the hope that the ambitious recommendations of this Habitat Plan are accomplished.

1.6 WHAT IS THE SCIENTIFIC FOUNDATION FOR THE HABITAT PLAN?

The recommendations of this Plan rest on a strong foundation of scientific assessment and analysis. A summary of the current scientific understanding of the watershed is provided in Chapter 4, Scientific Foundation, and Chapter 5, Habitat Management Strategies.

This understanding is based on years of study of the watershed that culminated in a Strategic Assessment during 2002-2004 (King County Department of Natural Resources and Parks et al. 2004). This Strategic Assessment consists of original research to fill in gaps in understanding identified by previous work. It also includes analysis that helped make sense of a tremendous amount of technical information and began the process of translating science into policy.

The scientific work in the Strategic Assessment was guided by the:

1) Viable Salmonid Population (VSP) framework (McElhany et al. 2000);

2) Habitat Plan Substantive Scope and Approach, approved by the Steering Committee in 2002; and

3) Technical guidance document developed by the Puget Sound Technical Recovery Team (2003) for integrated salmonid habitat recovery planning.

As the scientific foundation for the Habitat Plan, the Strategic Assessment includes information on:

- Historical and current habitat conditions;
- Salmonid population conditions;
- Fish utilization, including juvenile migration and rearing patterns, habitat usage, and habitat limiting factors; and
- Water quantity and quality.

The WRIA 9 Habitat Limiting Factors and Reconnaissance Assessment Report (Kerwin and Nelson (Eds.) 2000) and the State of the Nearshore Ecosystem Report (Brennan (Ed.) 2001) were used as raw material for further analysis as part of the Strategic Assessment.

The Strategic Assessment analysis included examining the functional linkages between habitat conditions and populations and developing conservation hypotheses. Conservation hypotheses are a "best estimate" of how improvements in habitat conditions and processes will lead to improvements in the four viable salmon parameters (abundance, productivity, diversity, and spatial structure) that are critical to long-term survival. The Strategic Assessment also identified necessary future conditions to support a viable population of Chinook salmon. The necessary future conditions are also essentially hypotheses about what is thought to be necessary habitat to recover the Green/Duwamish River Chinook population. The conservation hypotheses and necessary future conditions were ultimately used to develop habitat management strategies for each subwatershed (the watershed is divided into five subwatersheds [Figure 1-1] for analytical purposes).

Years of scientific assessment have yielded valuable understanding about how the marine nearshore, estuarine, and freshwater habitats of the watershed meet salmonid needs. This nearshore beach seining on Vashon/Maury helped determine salmonid presence. May 2001 photo.

These scientific products – information on conditions, conservation hypotheses, necessary future conditions, and habitat management strategies – have been essential tools in identifying, refining, reviewing, and revising the actions recommended in this Plan. They constitute a logic train (Figure 4-3) that link present scientific understanding to recommended future actions.

1.7 WHAT IS THE STRATEGY FOR HABITAT RECOVERY?

The results of the Strategic Assessment have made possible the identification of clear priorities for work over the next 10 years.

Scientific assessments – summarized in the WRIA 9 Habitat Limiting Factors and Reconnaissance Assessment (Kerwin and Nelson (Eds.) 2000) and WRIA 9 Strategic Assessment (2002-early 2005) – indicate that there are limiting habitats in the Duwamish Estuary transition zone; Middle Green, Lower Green, Duwamish Estuary, and Marine Nearshore Subwatershed rearing habitats; and Middle Green and upper Lower Green Subwatersheds spawning habitat. It also appears that a decline in productivity of the juvenile life stage undermines the viability of the population (King County Department of Natural Resources and Parks et al. 2004).

Based on this understanding, this Habitat Plan adopts the following as a 10-year strategy (cited as Policy MS1 in Chapter 5, Habitat Management Strategies and Policies):

The focus of management action (projects and programs) implementation efforts in this Habitat Plan will be on the following limiting habitats that exist within the Green/Duwamish and Central Puget Sound Watershed:

- Duwamish Estuary transition habitat;
- Middle Green River, Lower Green River, Duwamish Estuary, and Marine Nearshore rearing habitat; and
- Middle Green and Lower Green River spawning habitat.

Transition zone habitat, shown here at the Hamm Creek confluence with the Duwamish at river mile 5.0, is critical for Chinook juveniles. July 2002 photo.

Because of the importance of the Duwamish transition zone – where young salmonids make the transition from being freshwater fish to saltwater fish — and the negative effect on habitat recovery efforts upstream if a severe transition zone restriction does exist, 40% of funding for projects and programs will be focused on the transition zone. The remaining 60% of funding for projects and programs will be split between rearing and spawning limiting habitats. For example, if $100 million became available to implement this Plan, $40 million would be targeted toward rehabilitation of and increases to transition zone habitat. $60 million would be targeted toward high priority projects that protect, restore, rehabilitate, or substitute for rearing and spawning habitat.

The focus of habitat efforts in these areas will be on increasing the productivity of the population by improving the quality and quantity of habitats identified above.

This strategy is based on current understandings of how the watershed meets and does not meet the habitat needs of Chinook salmon. Additional information and analysis may lead to changes in how resources are allocated.

1.8 WHAT ARE THE KEY SALMON HABITAT NEEDS IN EACH SUBWATERSHED?

Based on the findings of the Strategic Assessment, the Habitat Plan focuses on actions and policies that address the following key salmon habitat needs:

Watershed-Wide Needs

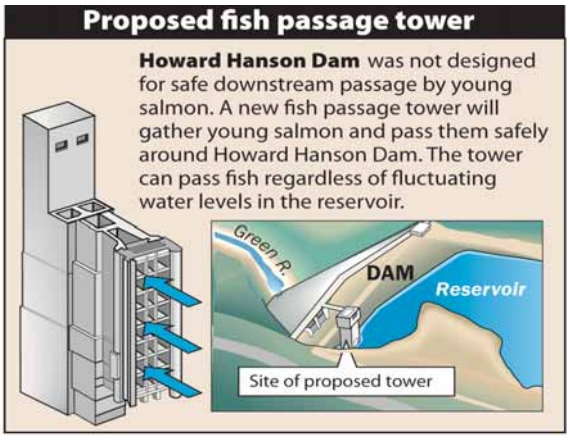
- Prevent and reduce armoring of stream banks and shorelines;
- Promote low impact development such as porous pavement, bioswales, and clustered development;
- Replace culverts that block fish passage on tributary streams;
- Protect and improve water quality by focusing on "nonpoint" pollution that comes from stormwater runoff from streets, highways, parking lots, roofs, yards, and cleared lands;
- Allow natural river flows in an unconstrained river channel where possible; and
- Maintain adequate stream flows.

Upper Green River Subwatershed

- Facilitate Chinook salmon and bull trout access above Howard Hanson Dam and the Tacoma Headworks by providing passage upstream for adults and downstream for the young fish;

Having Dams *and* Fish

■ **At river mile 61,** the Tacoma Diversion Dam diverts water to serve customers in Pierce and southern King County. Three miles upstream, Howard Hanson Dam holds back flood waters and stores water for late summer release. Both dams block upstream fish passage but beginning in 2007, adult salmon migrating upstream will be collected at the Tacoma Diversion Dam. The fish will be released into the Upper Green River to spawn, opening up the upper watershed to salmon for the first time since 1911.



- Protect and restore riparian habitat along the Upper Green River mainstem and major tributaries by restoring the riparian corridor, increasing channel complexity, and decommissioning old logging roads;
- Remove fish passage barriers such as culverts from tributary streams; and
- Protect and restore natural sediment movement by reducing road failures.

Middle Green River Subwatershed

- Protect and restore side channels, off-channel wetlands, tributary mouths, and pools that provide shelter and habitat complexity for young salmon;
- Protect and restore natural sediment movement by reconnecting sediment sources to the river;
- Protect and restore spawning and rearing habitat in lower Newaukum and Soos Creeks; and
- Maintain regional groundwater recharge and base flows to the mainstem Green River through forest retention and low impact development.

Lower Green River Subwatershed

- Protect and restore side channels, off-channel wetlands, tributary mouths, and pools that provide shelter and habitat complexity for young salmon;
- Protect and restore natural sediment movement by reconnecting sediment sources to the river;
- Preserve groundwater inflow from the historical White River channel; and
- Modify the Black River Pump Station to improve fish passage.

Duwamish Estuary Subwatershed

- Restore vegetated shallow subtidal and intertidal habitats and brackish marshes by restoring dredged, armored, and filled areas;
- Increase shallow water and slow water "transition zone" habitat where salmon transform from freshwater to salt water fish;
- Improve sediment quality through the Lower Duwamish Waterway Superfund cleanup;
- Protect and restore water quality through point and nonpoint pollution source control;
- Restore off-channel refuge habitat and mainstem pools in Tukwila; and
- Improve natural sediment transport and deposition processes.

Marine Nearshore Subwatershed

- Protect and restore lagoons, spits, and pocket estuaries where small streams enter Puget Sound;
- Protect and expand vegetated shallow water "nearshore" and marsh habitats;
- Protect feeder bluffs that provide sediment needed for beach nourishment by preventing and, where possible, removing bulkheads;
- Protect and expand forage fish spawning beaches used by herring, sand lance, and surf smelt; and
- Improve sediment quality, particularly in Elliott Bay.

The Habitat Plan calls for the creation of off-channel, shallow-water habitats like the Codiga project in Tukwila. May 2004 photo courtesy of City of Tukwila.

1.9 WHAT ACTIONS DOES THE HABITAT PLAN RECOMMEND TO PROTECT AND RESTORE SALMON HABITAT?

Chapter 7, Proposed Actions and Policies to Achieve a Viable Salmonid Population, lists the most important projects and programs to implement over the next 10 years to improve the aquatic ecosystem, thereby benefiting Chinook salmon, bull trout, and other salmonids. Of these projects, those that address the limiting habitats for the Green/Duwamish River Chinook population are considered of greatest priority and are listed in Table 8-2 (Chapter 8).

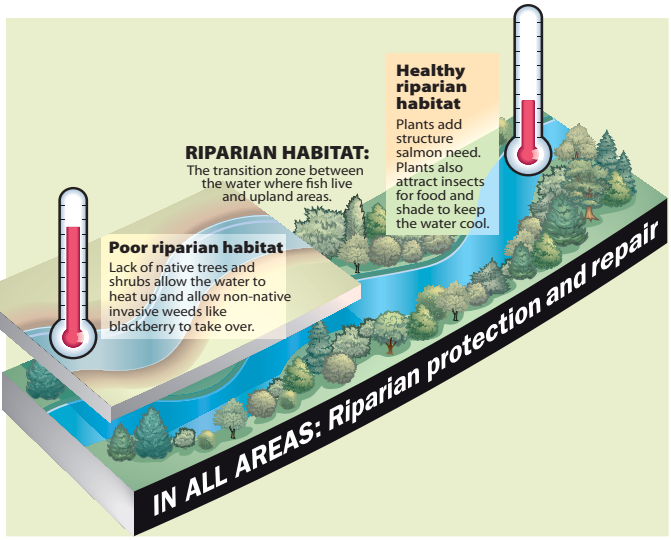
Actions in this Habitat Plan can be divided into two categories:

Programs: A body of work requiring staffing and/or funding. In this Plan, programs focus on stormwater management, stewardship/public education, internal government practices, and other governmental and non-governmental efforts.

Projects: On-the-ground actions to protect, restore, rehabilitate, or substitute habitat or the processes that create habitat.

The Plan recommends an array of projects and programs that watershed partners can strive to carry out over the next 10 years. These actions will:

- Protect existing processes and habitats that are working well;
- Restore processes and habitats that can be returned to good conditions;
- Rehabilitate damaged processes and habitats that can be sustained with on-going efforts; and
- Substitute processes and habitats that are lost.



In the first 10 years, the Plan recommends:

- 75 on-the-ground restoration projects;
- 57 habitat protection projects (including 50 habitat protection areas on Vashon/Maury Island and seven King County-proposed "Last Best Places Middle Green" acquisitions); and
- 30 programs (16 watershed-wide and 14 subwatershed).

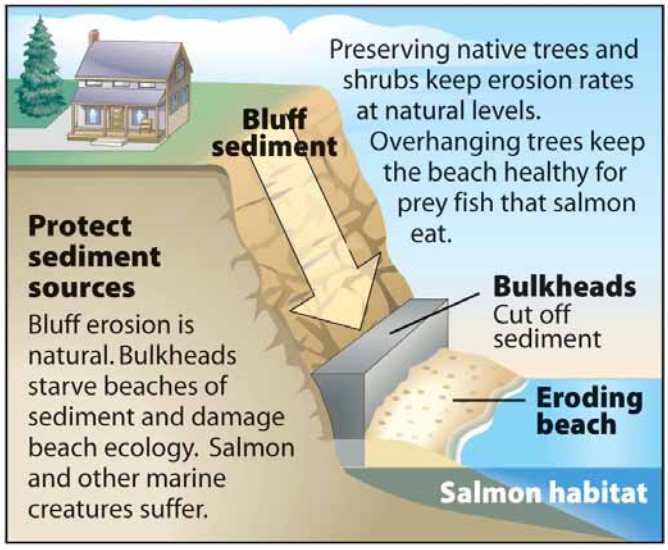
Even more opportunities for citizen stewardship, such as shown here at the joint City of Auburn-King County Fenster project, will occur under the Habitat Plan. October 2004 photo.

56 of the 75 on-the-ground habitat projects are considered the highest priority because of their importance in addressing habitat limiting factors affecting Chinook salmon (Table 8-2).

These recommended actions were identified and evaluated by people who understand the watershed. Each project had to pass both a scientific/technical review and a feasibility review to be included in this Plan. As with many recommendations in this Plan, it is expected that these projects will be refined in the years to come as ever more scientific information becomes available.

Projects are on-the-ground efforts that move earth and plant trees, including:

- Excavating shallow water habitat in estuarine and marine nearshore habitats;



- Installation of large woody debris in freshwater habitats;
- Planting of native vegetation in both marine and freshwater habitats;
- Control of noxious and invasive weeds throughout the watershed;
- Levee setbacks on the Green River mainstem;
- Introduction of spawning gravel in the Green River mainstem;
- Side channel reconnection in freshwater habitats; and
- Removal of bulkheads or replacement with softer forms of shoreline protection in marine nearshore habitats.

Complementing these restoration/rehabilitation/substitution projects are projects to protect high value habitat. Depending on the habitat value, location (e.g., next to a migrating channel), and interest of the landowner, these projects will make use of property acquisition, conservation easements, incentives, and/or information and education.

The recommended projects in this Plan will complement on-going and planned habitat activities such as:

- Good stewardship of streams, shorelines, and uplands by homeowners;
- Implementing farm plans and other conservation measures by farmers;
- Sustainable forestry practices by small woodlot owners;
- Use of BuiltGreen™ and other low impact development practices by developers;
- Habitat restoration projects organized by non-profit organizations and carried out by thousands of volunteers;
- Improved stormwater management by local governments;
- Sound land use planning and growth management by local governments;
- Fish passage facility construction and operation to the Upper Green River Subwatershed by the U.S. Army Corps of Engineers and the Tacoma Public Utilities; and
- Many other innovative, sustained efforts by individuals, groups, businesses, and governments intended to improve water quality and protect and restore salmon habitat.

Finally, the Plan includes policies that provide high-level guidance to activities that directly or indirectly affect salmon habitat.

These Auburn high school students improved habitat by planting trees at Whitney Bridge Park at river mile 40.3 on the Green River. October 2004 photo.

1.10 HOW MUCH WILL IMPLEMENTATION COST AND WHAT ARE THE BENEFITS?

Implementation of the priority projects (Table 8-2) recommended by this Habitat Plan are estimated to cost from $198 million to $291 million. Implementation of all projects recommended by this Plan would cost from $272 to $389 million. Cost estimates for the policies and programs were not developed.

Chapter 8 of this Plan provides a strategy for implementing this Plan's recommendations, including funding scenarios. Additionally, there is a Puget Sound-wide effort being undertaken by Shared Strategy to develop a finance plan for implementing the Puget Sound Salmon Recovery Plan. Preliminary approaches of the Puget Sound-wide effort include a mix of federal, state, and local funding sources to pay for implementation.

The expenditure of these substantial sums, fortunately, will benefit far more than the silver fish. WRIA 9 ecosystems produce $1.7-6.3 billion of value in goods and services every year for individuals, communities, businesses, and governments within WRIA 9. The value of salmon restoration and healthy ecosystems to future generations is likely to be even greater as the population grows and the amount of habitat is reduced (Asia-Pacific Environmental Exchange 2005). Expenditures on the recommendations of the Habitat Plan will help secure the current stream of goods and services and may increase their value.

1.11 HOW ARE HARVEST AND HATCHERY CONSIDERATIONS ADDRESSED?

Effective and efficient recovery of Puget Sound Chinook populations depends on addressing the causes of salmonid decline including:

- Habitat degradation;
- Hatchery practices; and
- Harvest management.

The Habitat Plan currently does not address hatchery and harvest practices because these are the responsibility of the co-managers (Treaty Tribes and the Washington State Department of Fish and Wildlife). As of mid-2005, the WRIA 9 partners were informed that the Washington State Department of Fish and Wildlife had committed to lead the effort to complete the integration of habitat, hatchery, and harvest recovery efforts at both the watershed level and at the Puget Sound regional level.

Following this so-called "H-integration" effort, it may be necessary to review elements of this Plan to determine whether and how decisions made regarding hatchery and harvest practices affect the habitat-focused recommendations of this Plan.

1.12 DOES THE HABITAT PLAN ALSO BENEFIT BULL TROUT AND OTHER SPECIES?

In addition to addressing the habitat needs of Chinook, this Habitat Plan will also provide habitat improvements for bull trout, listed by the U.S. Fish and Wildlife Service as threatened in November 1999. The ecosystem approach – with a focus on habitats and the processes that create those habitats – is intended to benefit all salmonid species.

Very little is known about bull trout presence and use of habitats in WRIA 9 but Appendix K of Volume II provides a matrix showing how the recommendations in this Plan address the bull trout recovery actions listed in the Draft Recovery Plan for the Coastal-Puget Sound District Population Segment of Bull Trout (U.S. Fish and Wildlife Service 2005).

1.13 HOW WILL MONITORING AND ADAPTIVE MANAGEMENT BE USED TO GUIDE HABITAT RECOVERY?

Successful implementation of the Habitat Plan actions depends on monitoring and adaptive management.

Monitoring of projects will occur at multiple levels. Implementation monitoring will tell us which projects have been carried out. Effectiveness monitoring will determine whether the habitat objectives of the project have been achieved. Finally, validation monitoring will confirm whether the actions of this Plan are achieving the desired changes in the population parameters of abundance, productivity, diversity, and spatial structure. Worthwhile monitoring is in turn informed at the outset by adaptive management.

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of actions. Adaptive management embodies a simple imperative: policies are experiments – learn from them. Adaptive management recognizes that uncertainty and unexpected changes are inherent in managing complex ecological systems. Adaptive management relies on a problem-solving approach to address this uncertainty through six steps: (1) assessment, (2) design, (3) implementation, (4) monitoring, (5) evaluation, and (6) adjustment. The actions recommended in this Plan and the success of salmon restoration within the Green/Duwamish and Central Puget Sound Watershed depend on a rigorous monitoring and adaptive management program.

Together, monitoring and adaptive management will provide a stream of information and insight that can inform course corrections as the recommendations of this Plan are implemented.

1.14 WHAT IS THE ROLE OF CITIZENS?

Although the bulk of the recommendations in this Habitat Plan are likely to be carried out through a partnership of governments, the long-term health of the watershed in terms important to both people and fish will be influenced greatly by those who call it home.

In daily life, we who share this watershed have an impact on its health. Daily practices in the home, in the yard, and with our cars are magnified by our numbers and concentrated by water. Every volunteer who picks up a shovel to control invasive weeds or plant native trees is acting for a better watershed.

Ultimately a healthy watershed depends on the actions of all of us in our roles as consumers, business people, students, members of myriad organizations, and citizens in a community.

Consequently, this Plan recommends policies and programs to promote ever greater understanding and action by all of us. You can start today by visiting the watershed website — http://dnr.metrokc.gov/Wrias/9/index.htm — which contains abundant tips and links for salmon-friendly living.

The future of salmon is in our hands. Juvenile salmonid in the Duwamish. May 2005 photo.

1.15 NEXT STEPS

The publication of this Salmon Habitat Plan commences the 90 day review period by the WRIA 9 Forum of Local Governments. The Forum may approve the Plan or remand it back to the Steering Committee for further deliberation. However, the Forum cannot make changes to the Plan. Following adoption of the Plan by the Forum, a minimum of five cities representing at least 70% of the population within the watershed must ratify the Plan before their respective legislative bodies. Only then will the Habitat Plan truly become final.

This Habitat Plan also will be included as a chapter in the Puget Sound Salmon Recovery Plan produced through the Puget Sound Shared Strategy.

Within a year of Plan ratification, we will need to develop a detailed implementation plan and begin to pursue funding. We also need to arrive at agreements among all of the WRIA 9 participating jurisdictions on how to fund and implement the Plan. As a watershed, what assurances can we make and what risks are we willing to take are fundamental questions that need to be answered.

In the long term, use of the action evaluation tools and the monitoring and adaptive management approach described in this Plan will allow local governments to continue to use the habitat planning process to meld Plan recommendations with their local regulations, policies, plans, and programs.

A lot of hard work lies ahead. Progress to date, however, and the love that so many people have for the place we call home offers tremendous hope. We know that it is not our generation alone that thrills to the sight of the mighty Chinook salmon returning to the Green/Duwamish River after years in the ocean. It is not just those of us alive now who enjoy the many benefits of a healthy watershed. Future generations depend on us to be good stewards and to recognize that clean water and healthy habitat are good for people and are good for fish.

Let's get to work "making our watershed fit for a King."